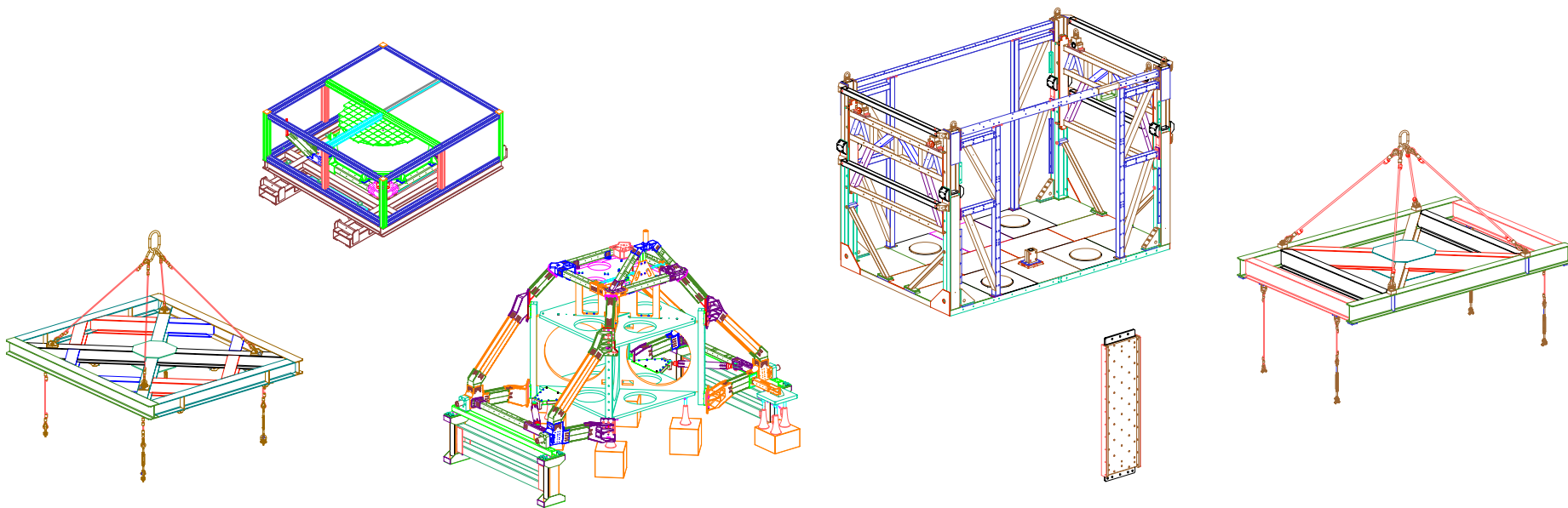
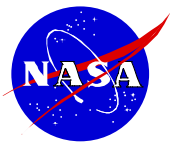


AMS Ground Support Equipment (GSE) Mechanical Design and Ground Operations at JSC, KSC, and Europe

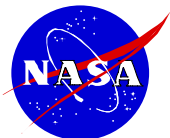


Ross A. Harold
Lockheed Martin Space Operations



AMS-02 Ground Support Equipment

- Assembly Fixture (AF)
- Primary Support Stand (PSS)
- Lower USS Shipping Fixture (LUSF)
- Intermediate Support Fixture (ISF)
- Multi-Purpose Lifting Fixture (MPLF)
- Primary Lifting Fixture (PLF)



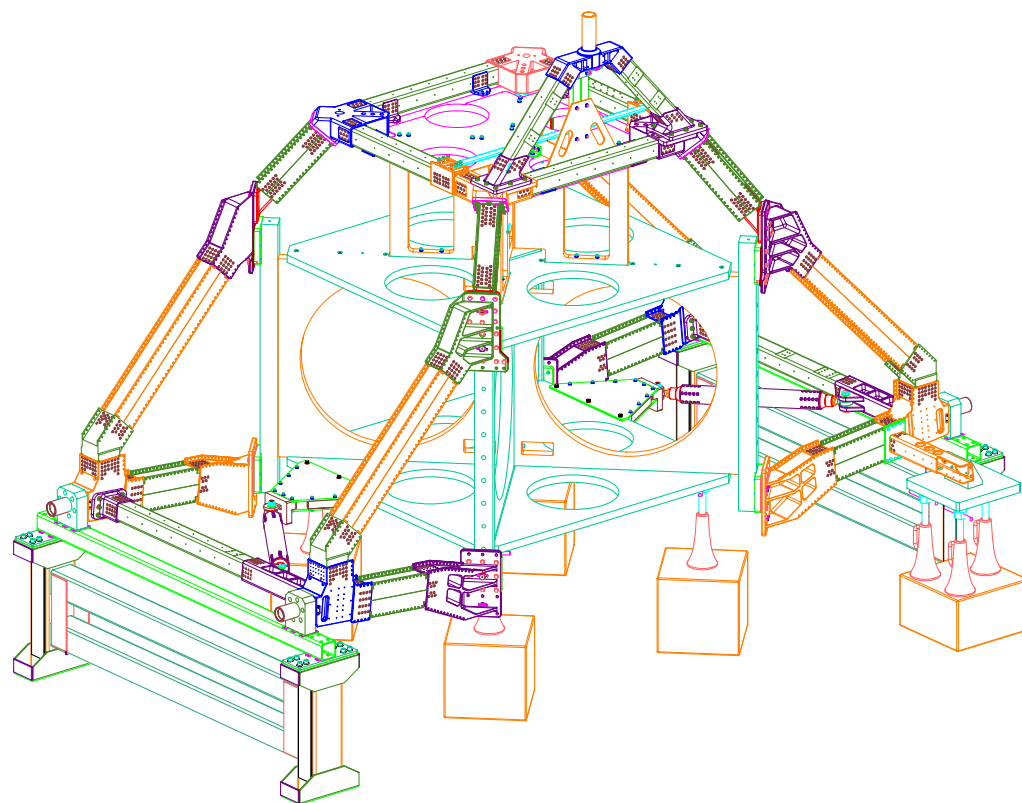
Assembly Fixture

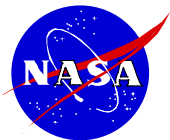
Primary Functions:

- Simulates the Vacuum Case (VC), AMS-02 Experiment interfaces and Orbiter interfaces
- Supports USS-02 structure during ground operations when VC is removed

Design Features:

- All bolted construction
- Made from 6061 al. plate and 7075 extruded tubing left over AMS-01
- Uses existing AMS-01 GSE





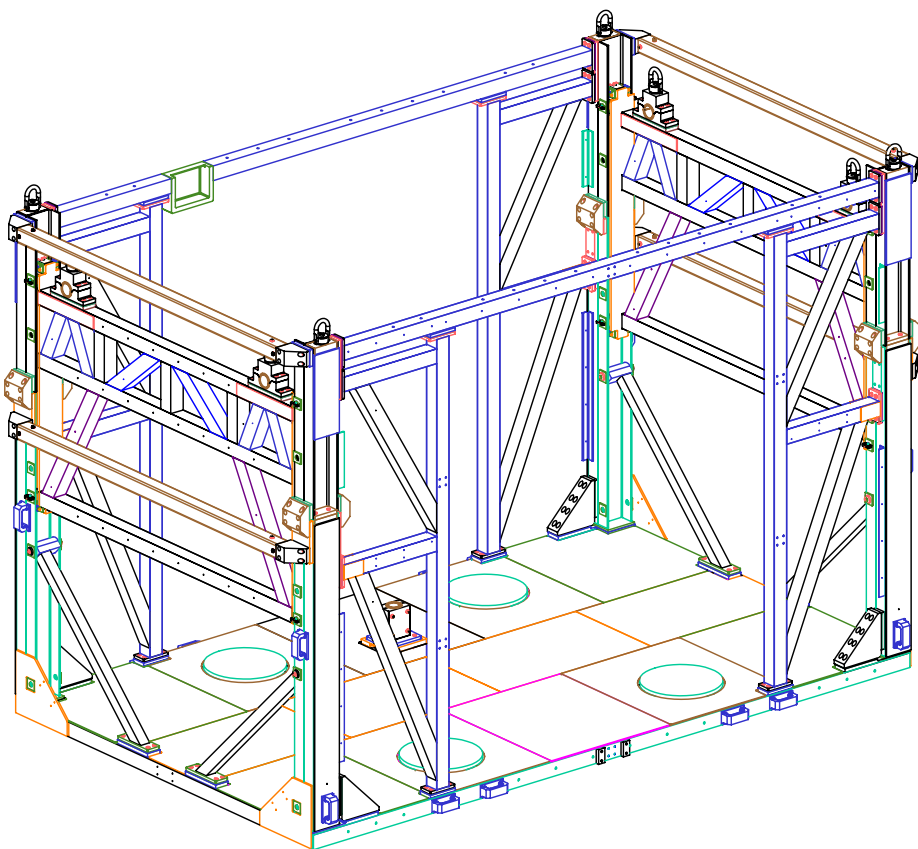
Primary Support Stand (PSS)

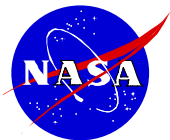
Primary Functions

- Integration stand
- Shipping fixture
- Thermal vacuum chamber test stand

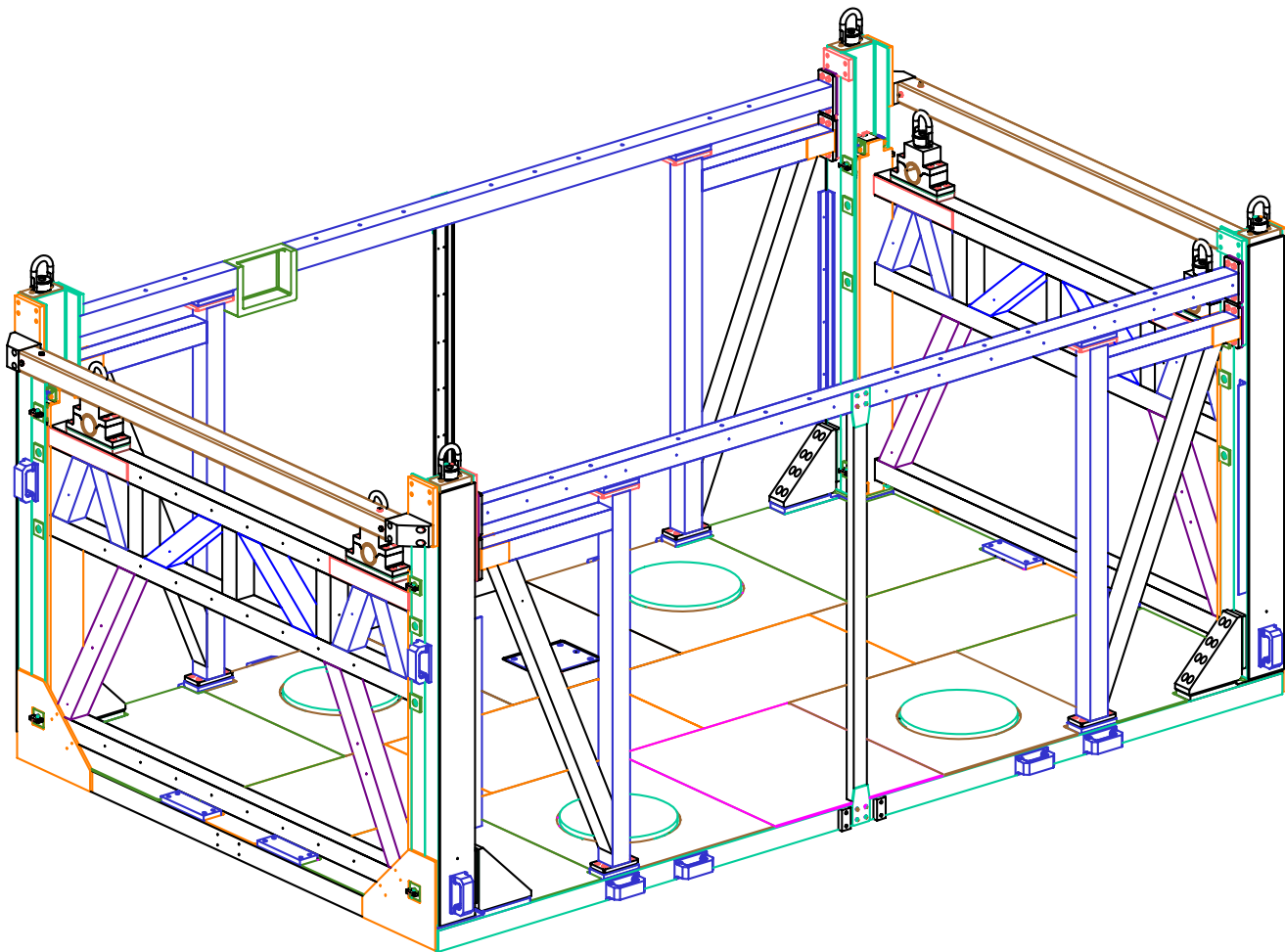
Design Features

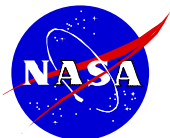
- All Aluminum 6061-T6 welded and bolted structure
- No metal finish due to vacuum chamber stand requirement
- Removable structural members to facilitate integration
- Adjustable to 3 different heights



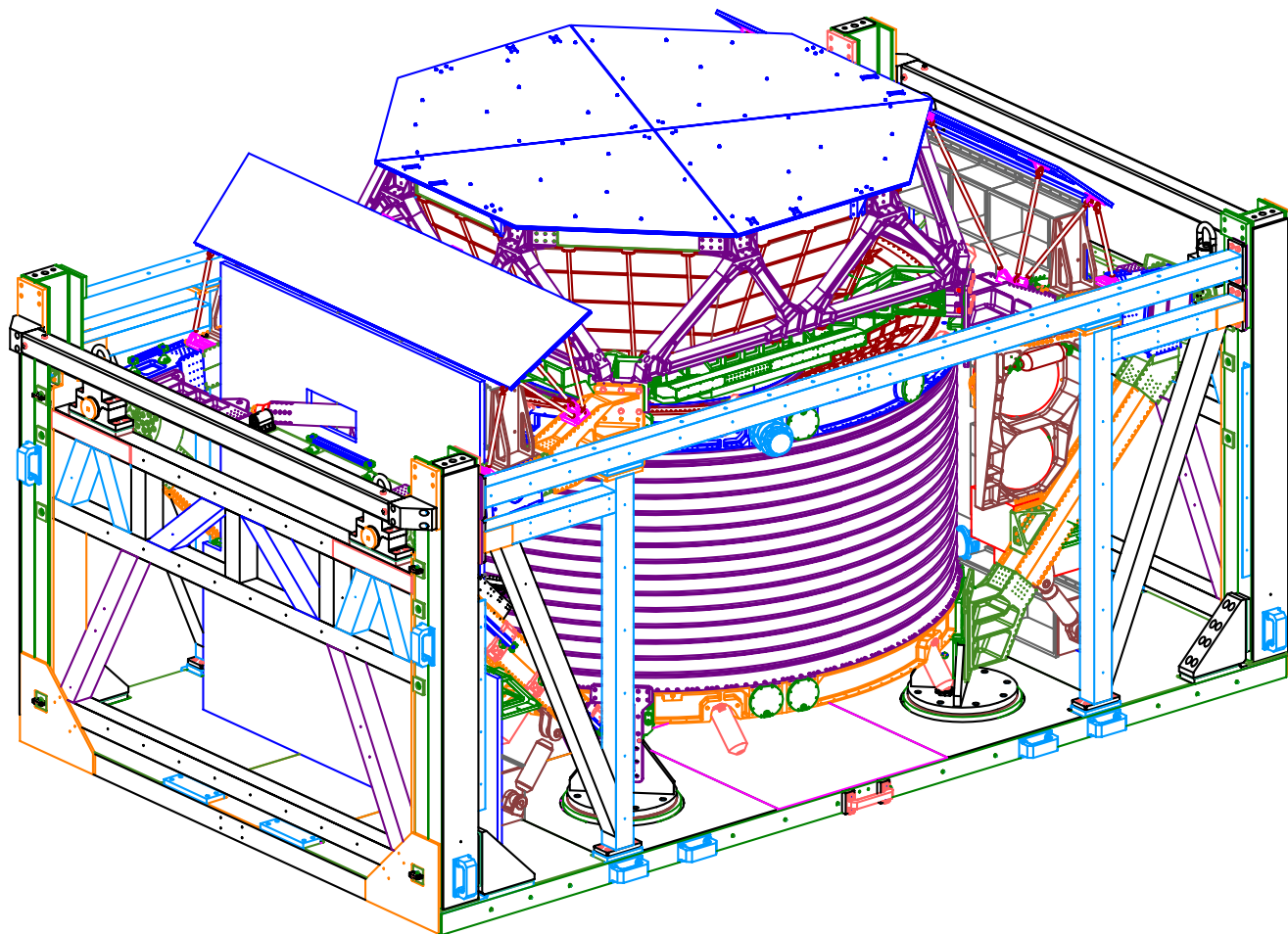


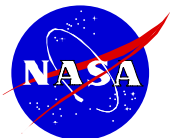
PSS - Low Configuration



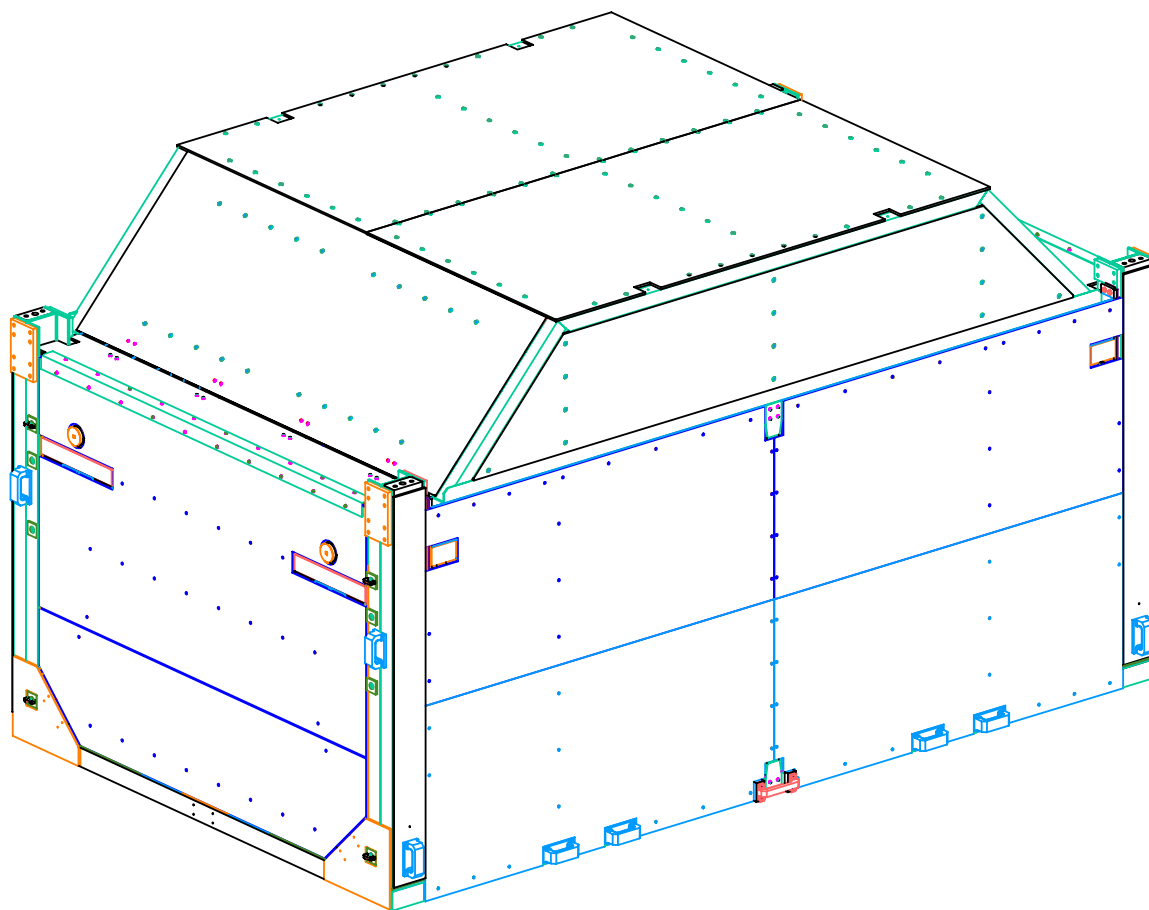


Upper AMS-02 Payload shipping configuration at JSC, CERN, and ESTEC

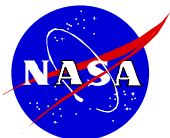




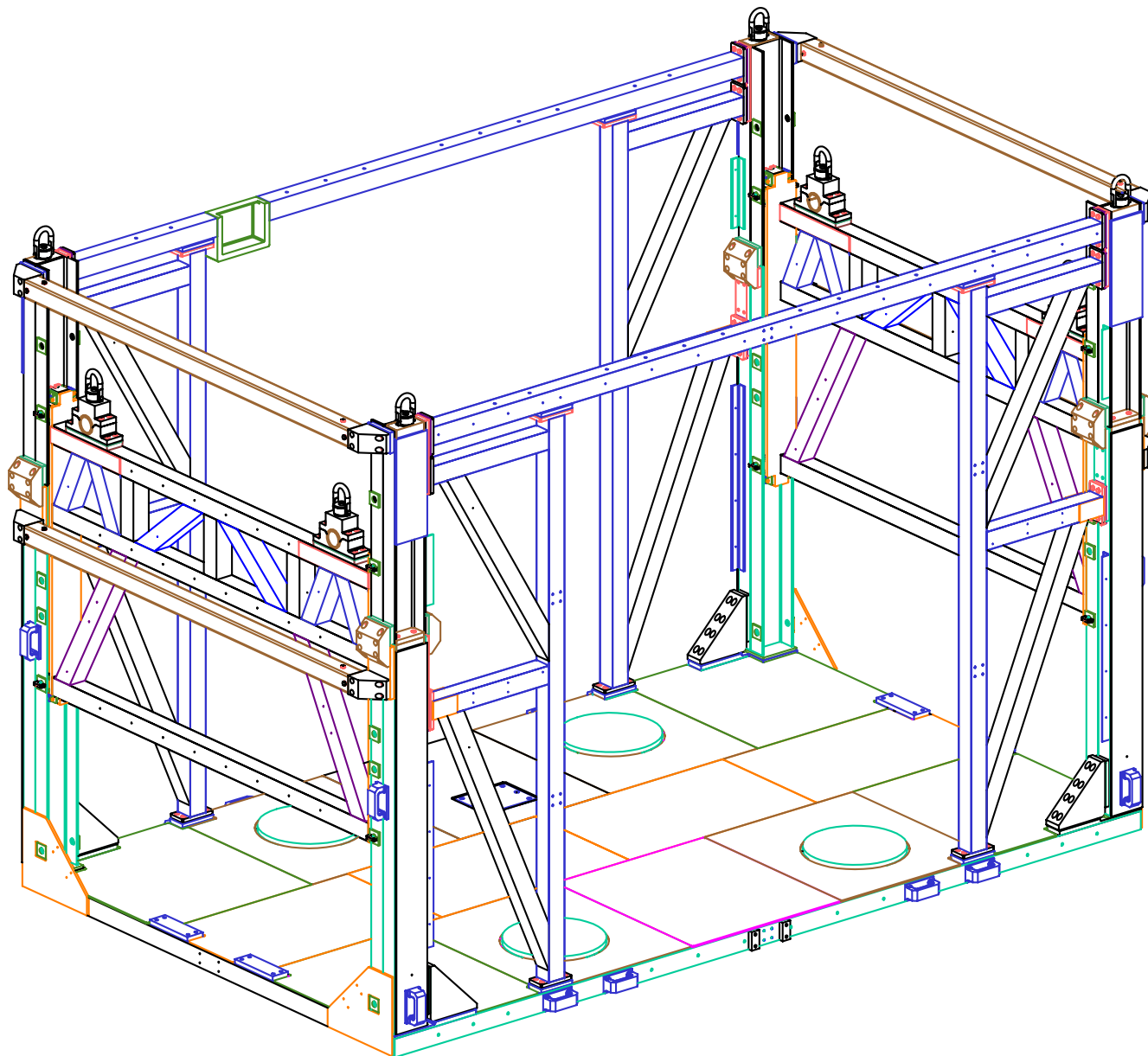
Upper AMS-02 Payload shipping configuration at JSC, KSC, CERN, and ESTEC

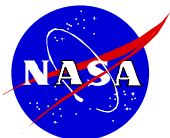


- Close out panels made from Alupalite paneling (painted aluminum face sheet with plastic corrugate)

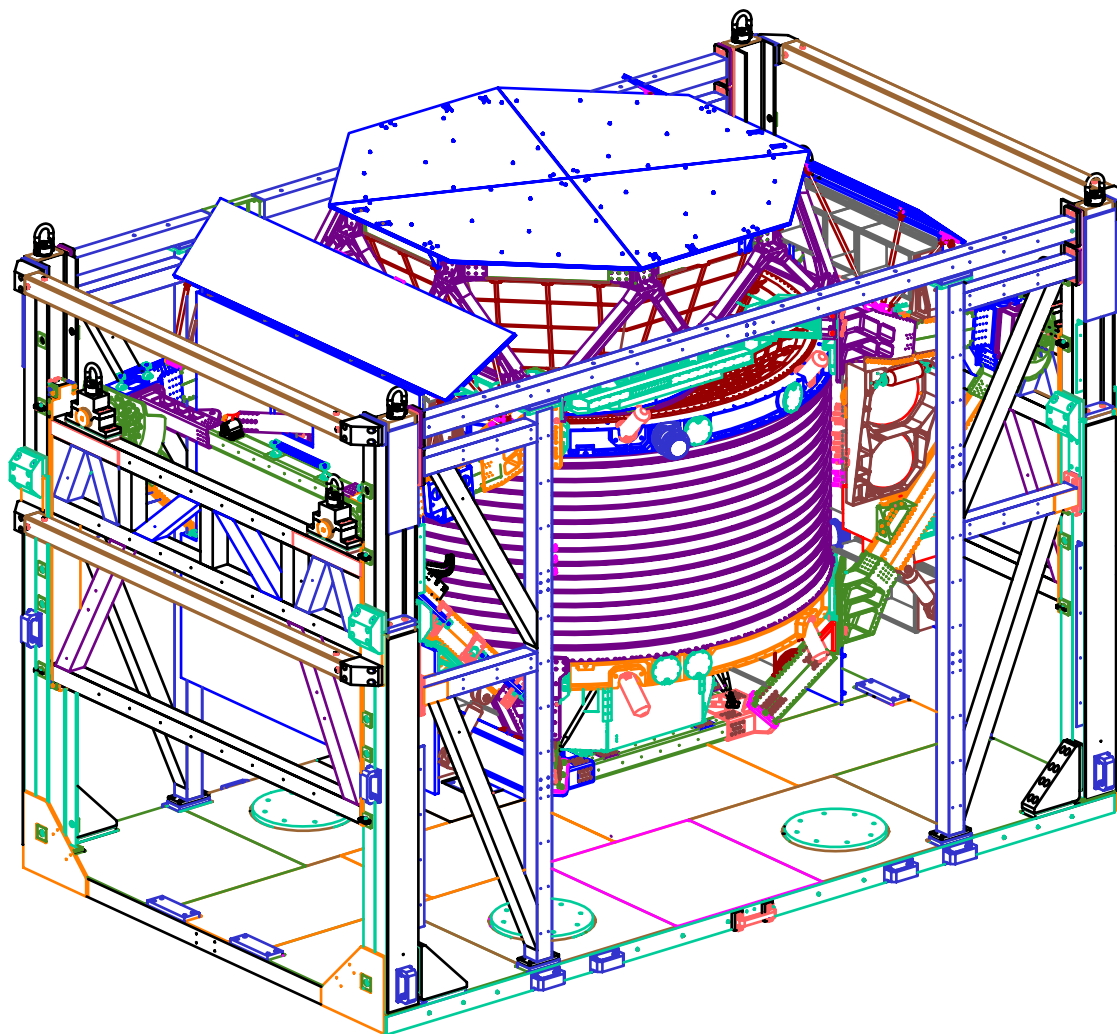


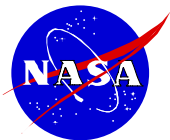
PSS - Mid Configuration



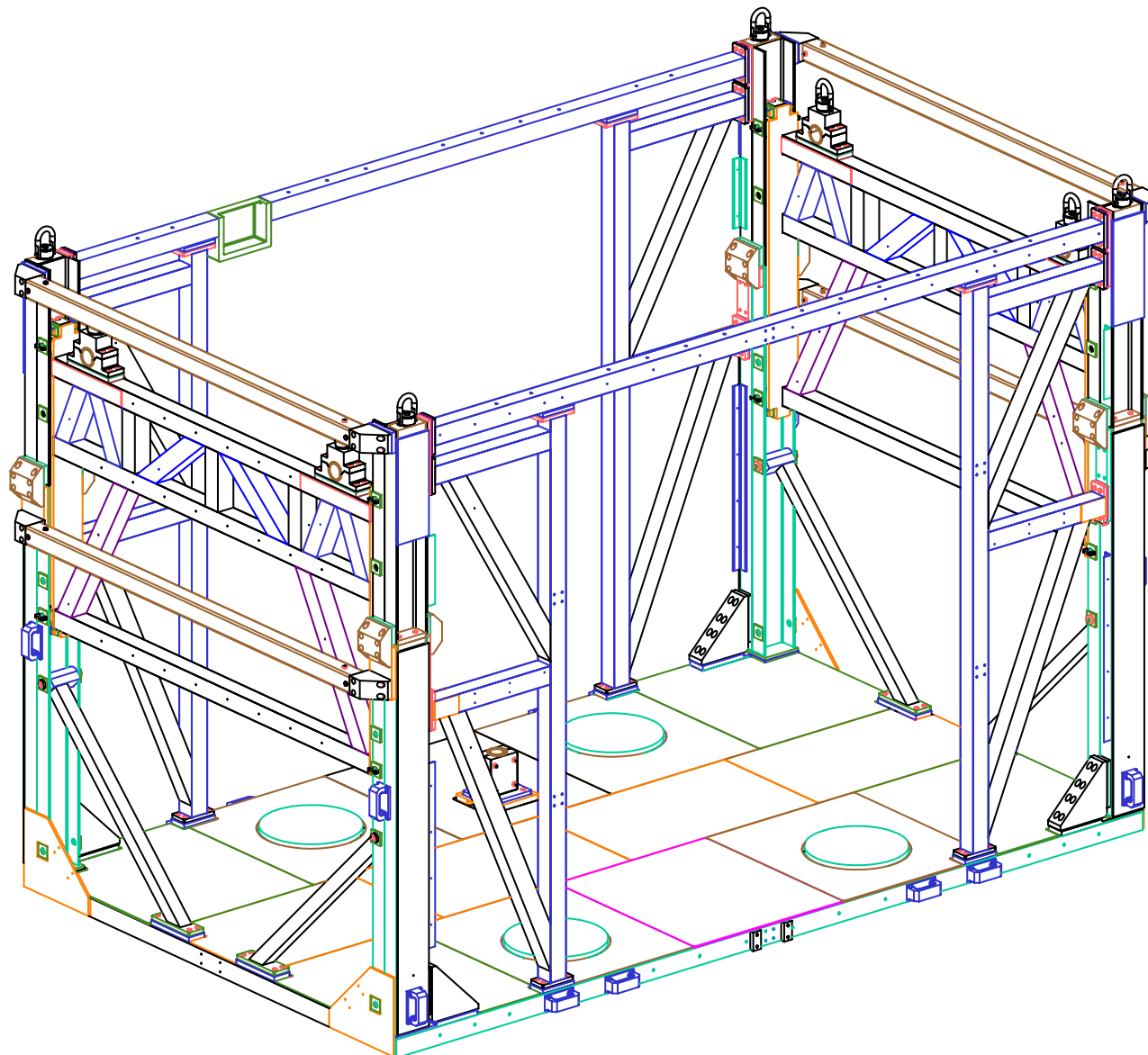


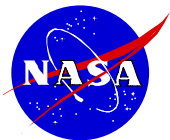
PSS – Experiment Integration and Thermal Vacuum Test Configuration at JSC, KSC, CERN, and ESTEC



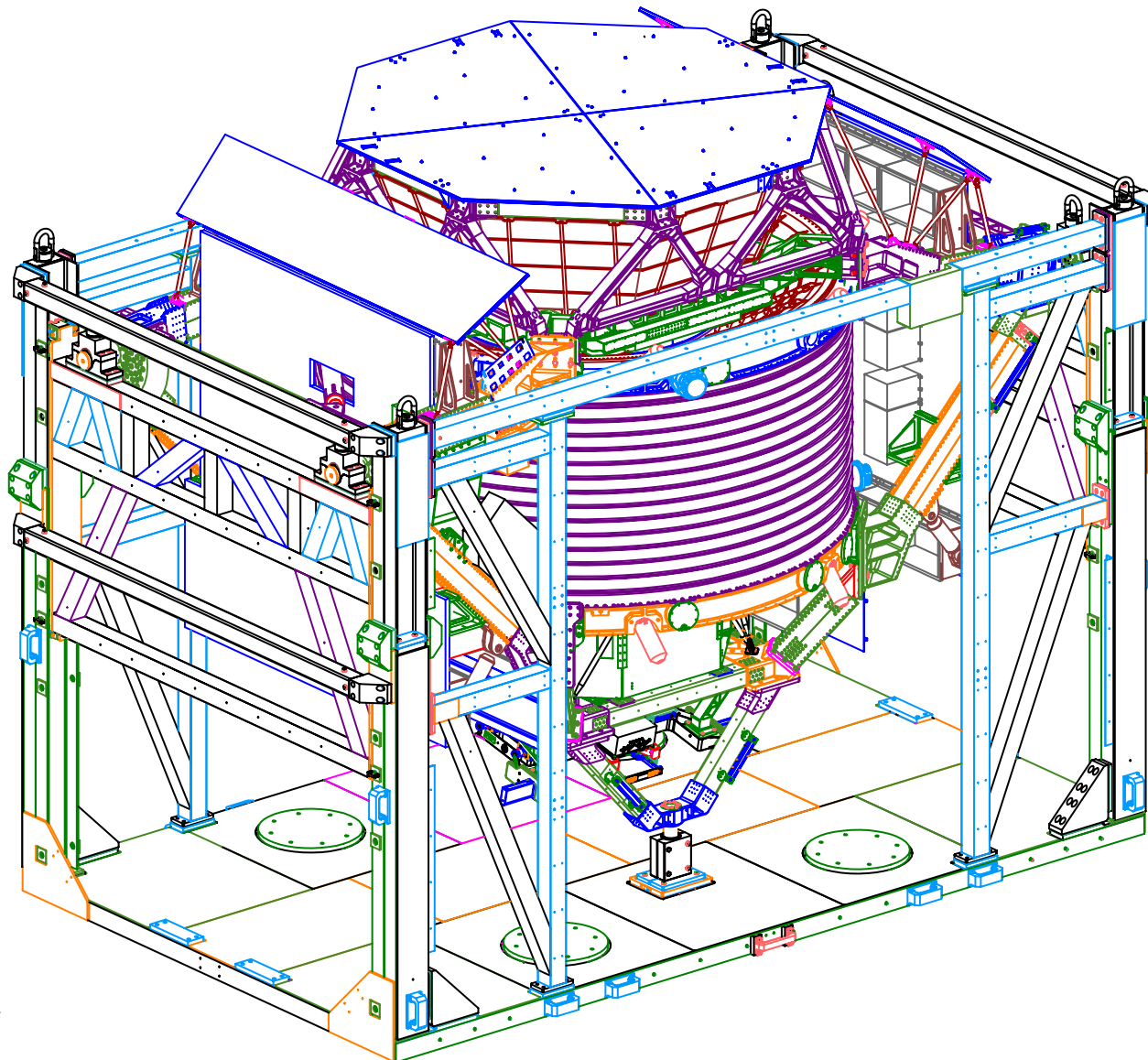


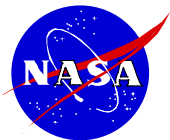
PSS - High Configuration



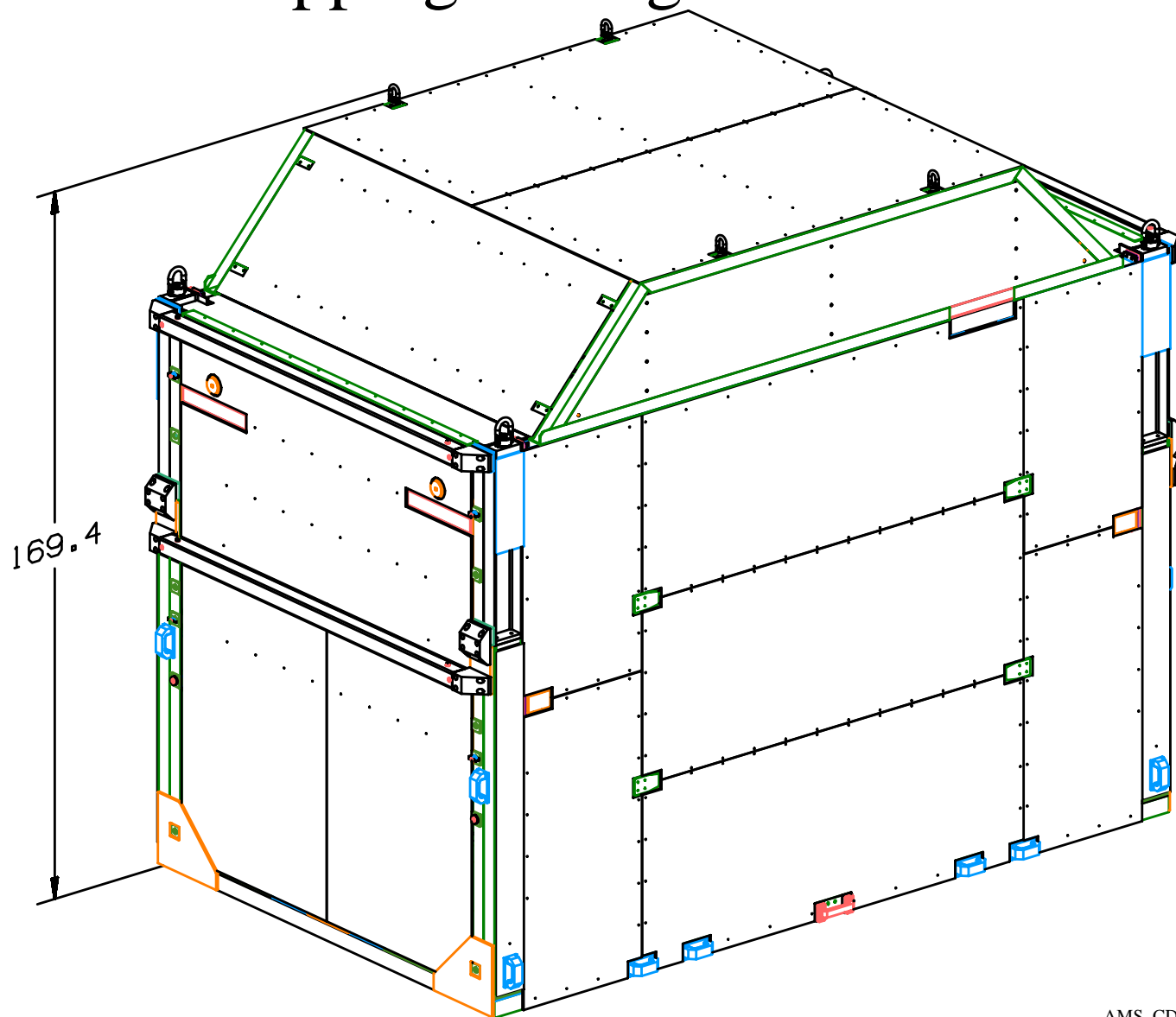


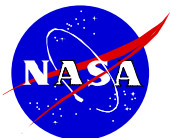
AMS-02 Payload Complete at KSC



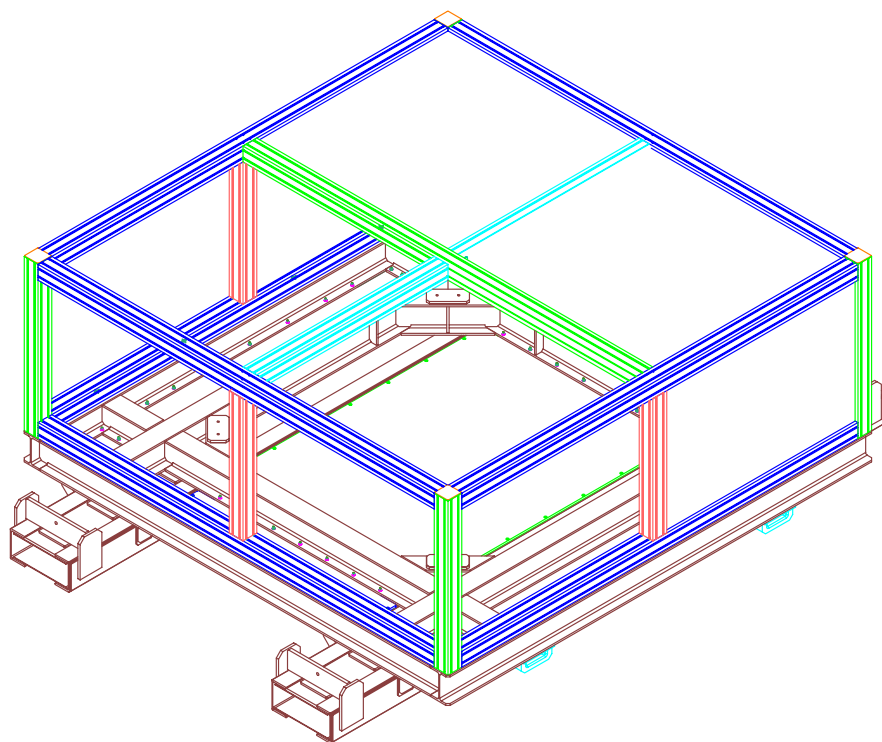


High Level Shipping Configuration at JSC and KSC





Lower USS Shipping Fixture

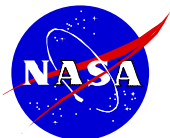


Primary Functions

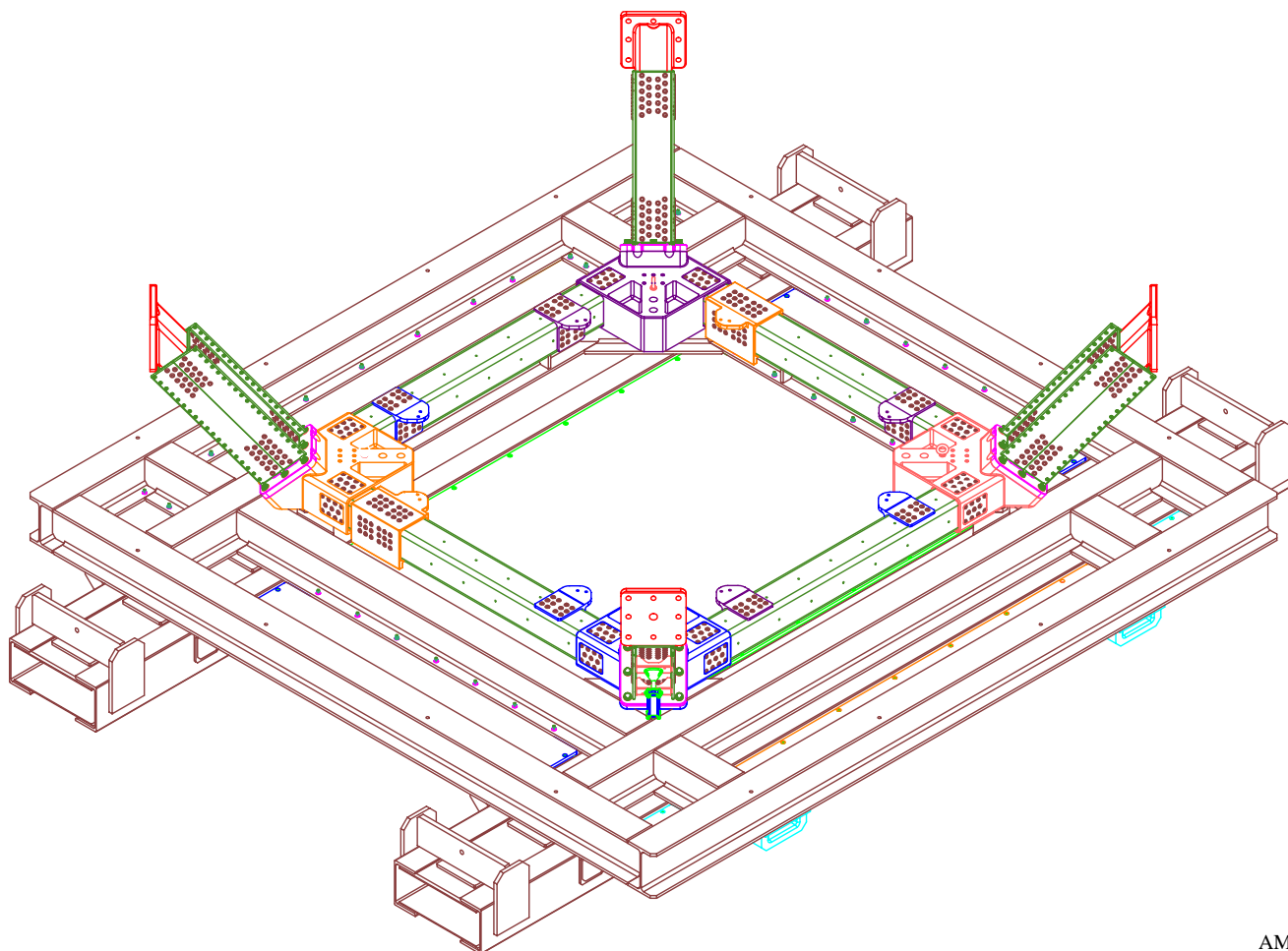
- Shipping fixture for the Lower USS-02 and AMS-02 Experiment
- Installation fixture for Lower USS-02 and AMS-02 Experiment components.

Design Features

- Weldment made from welded 6061-T6 aluminum
- Close out panels made from Alupalite paneling

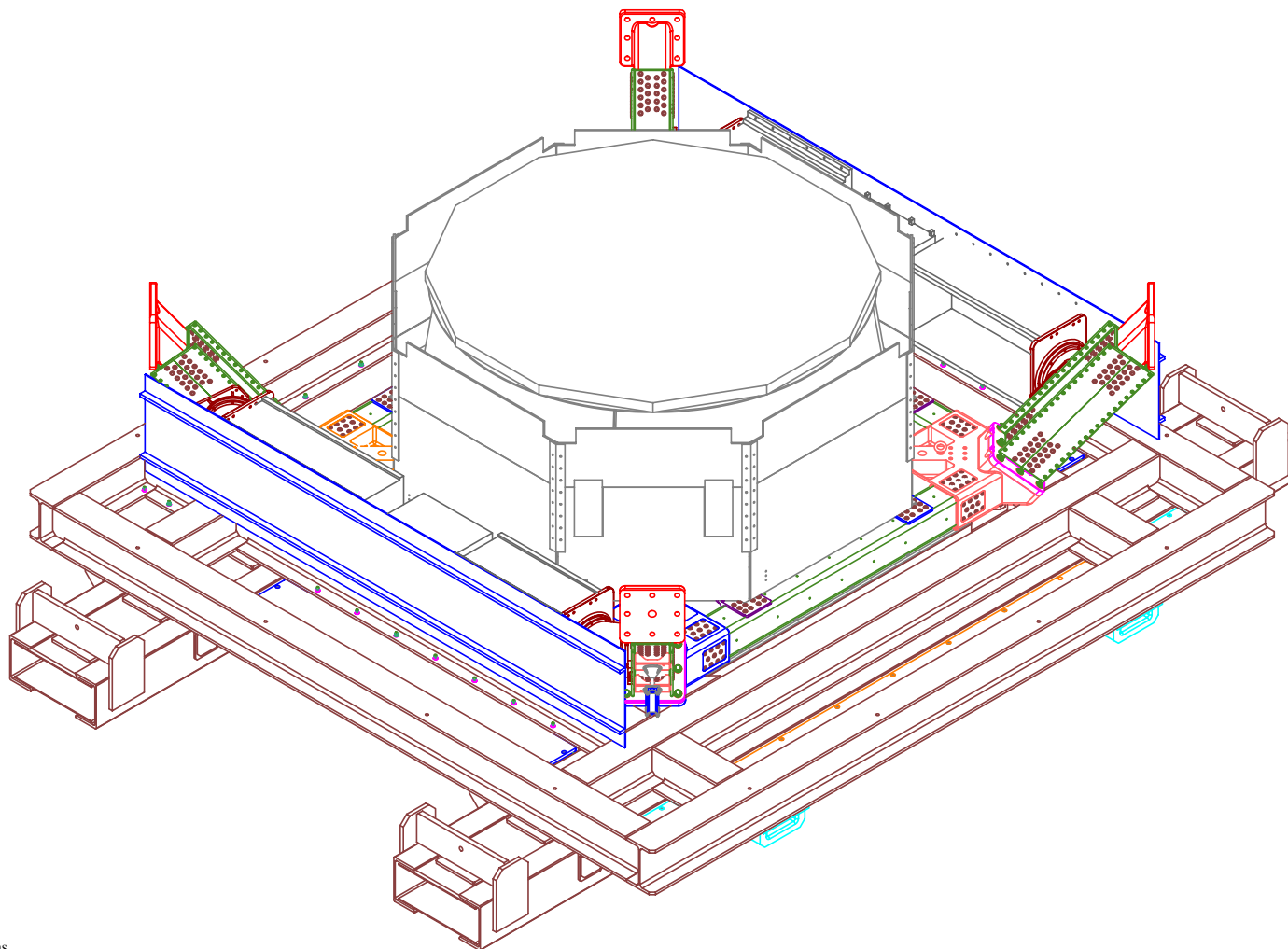


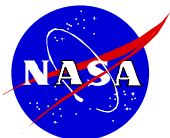
Lower USS shipping configuration at JSC and INFN



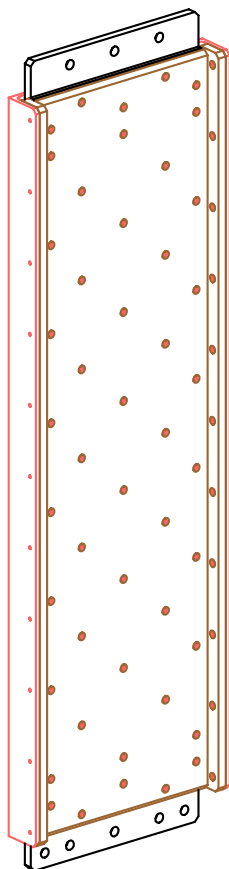


Lower AMS-02 Payload shipping configuration at LAPP - Annecy, CERN, ESTEC, and KSC

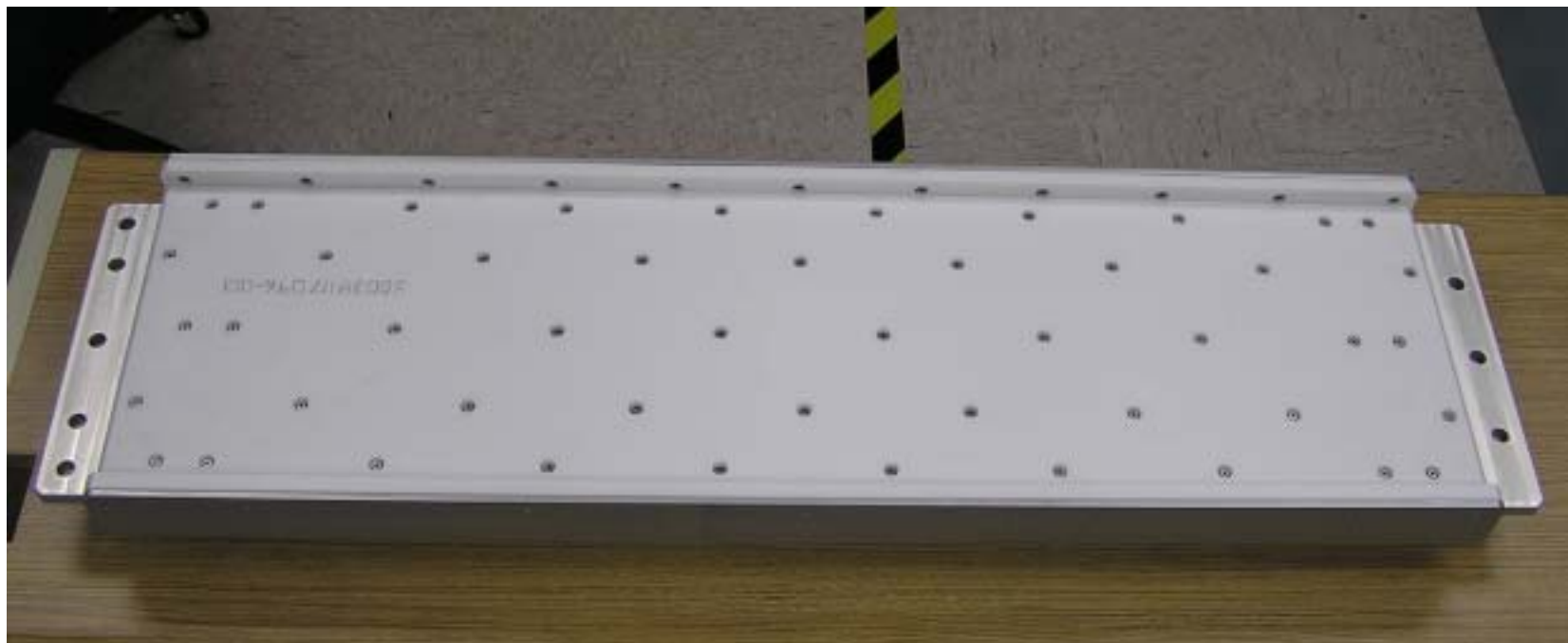
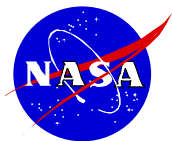


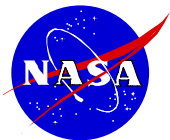


Intermediate Support Fixture (ISF)



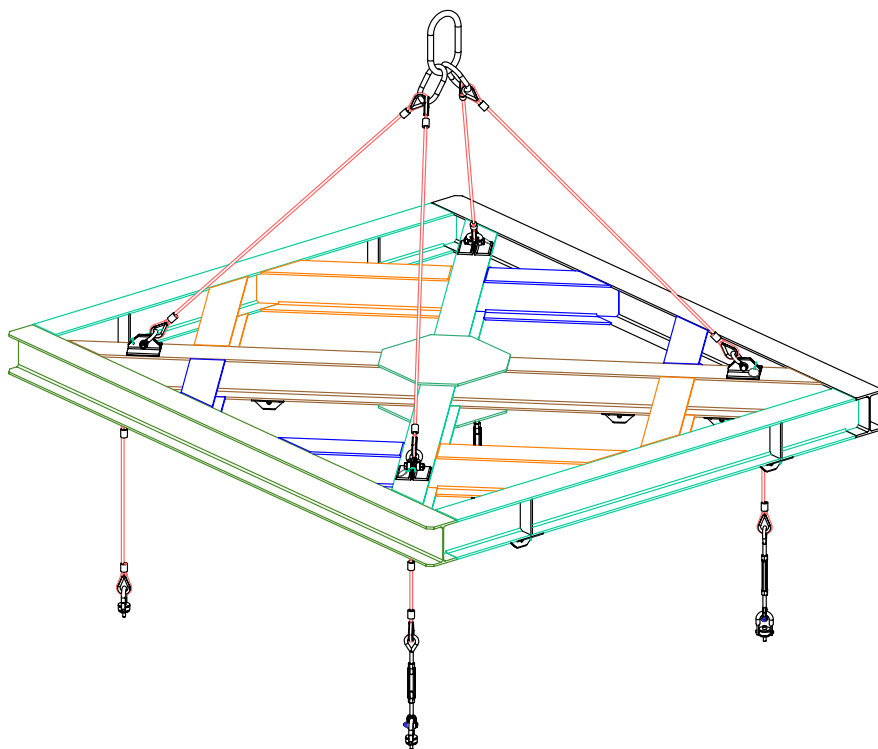
- Stabilizes and Supports USS VC Joints during VC installation and removal
- Teflon scuff surfaces to guide VC into position



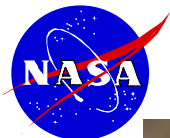


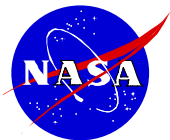
Multi-Purpose Lifting Fixture (MPLF)

- Made from welded A-36 structural steel shapes
- Proof loaded in all lifting configurations:
 - Assembly Fixture
 - Vacuum case
 - PSS shipping cover
 - Lower USS shipping fixture
 - Lower AMS-02 Payload
 - Vacuum Case Test Fixture (VCTF)

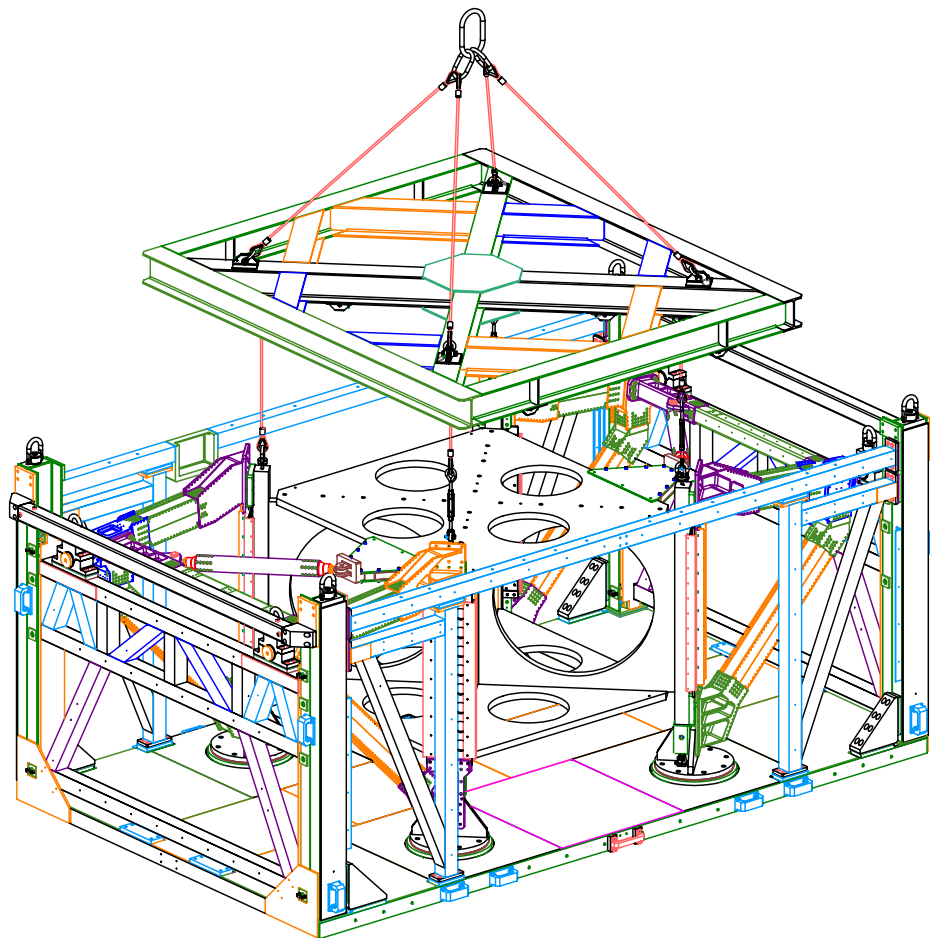


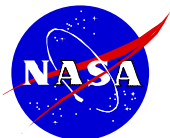
Used at SCL with VC, JSC, KSC, and ESTEC



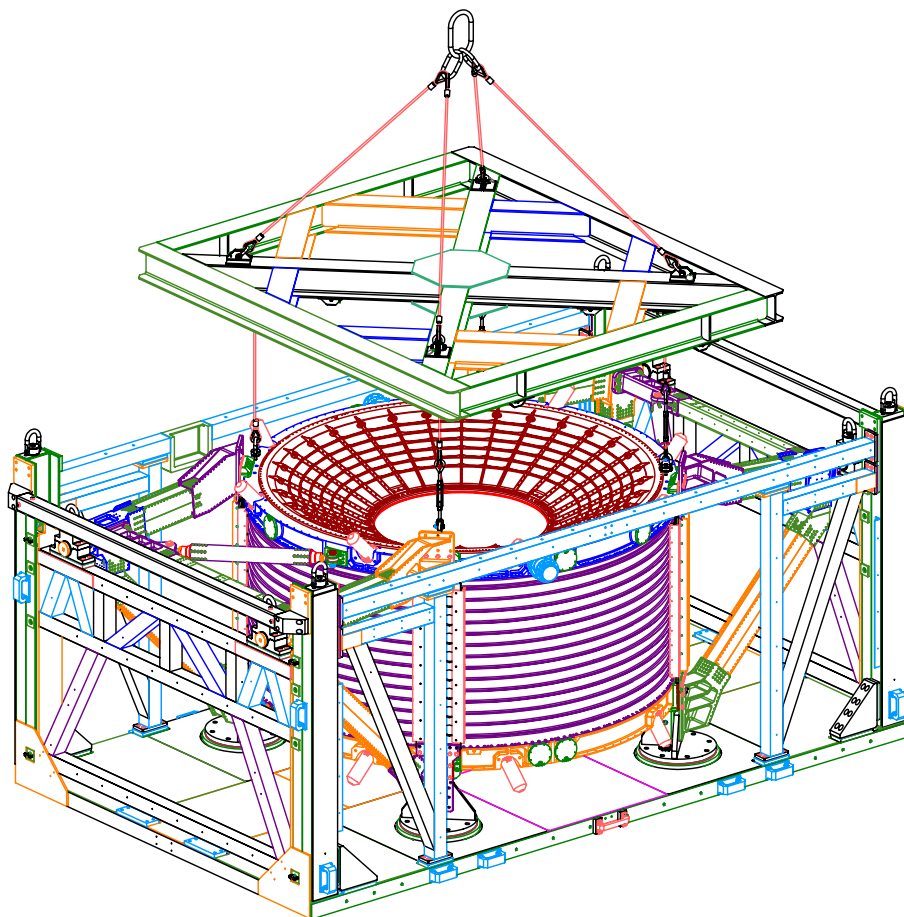


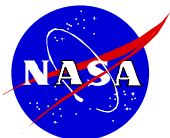
Assembly Fixture installation and removal at JSC and CERN



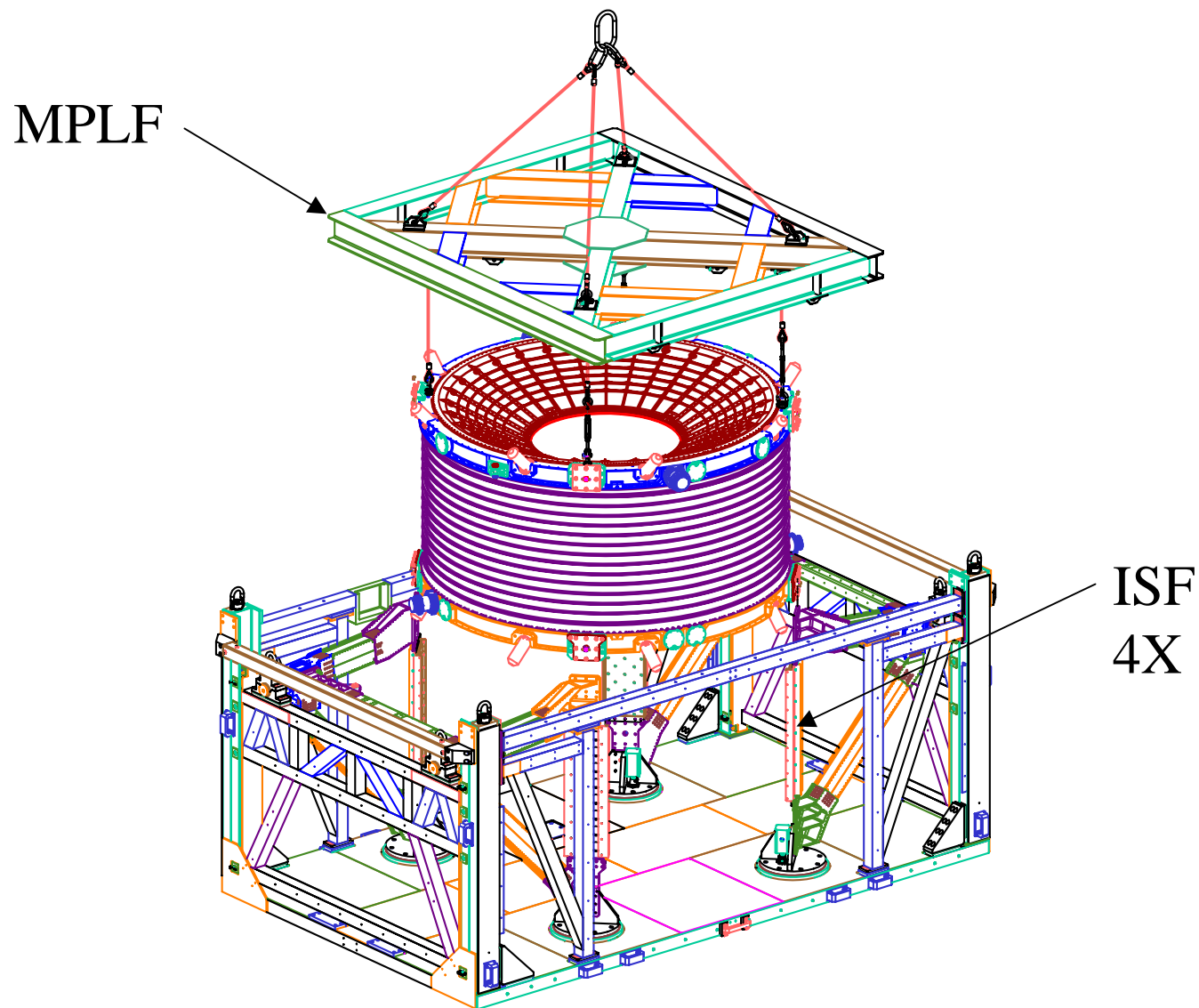


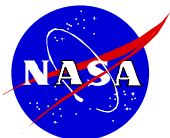
Vacuum Case (VC) installation and removal at JSC and CERN



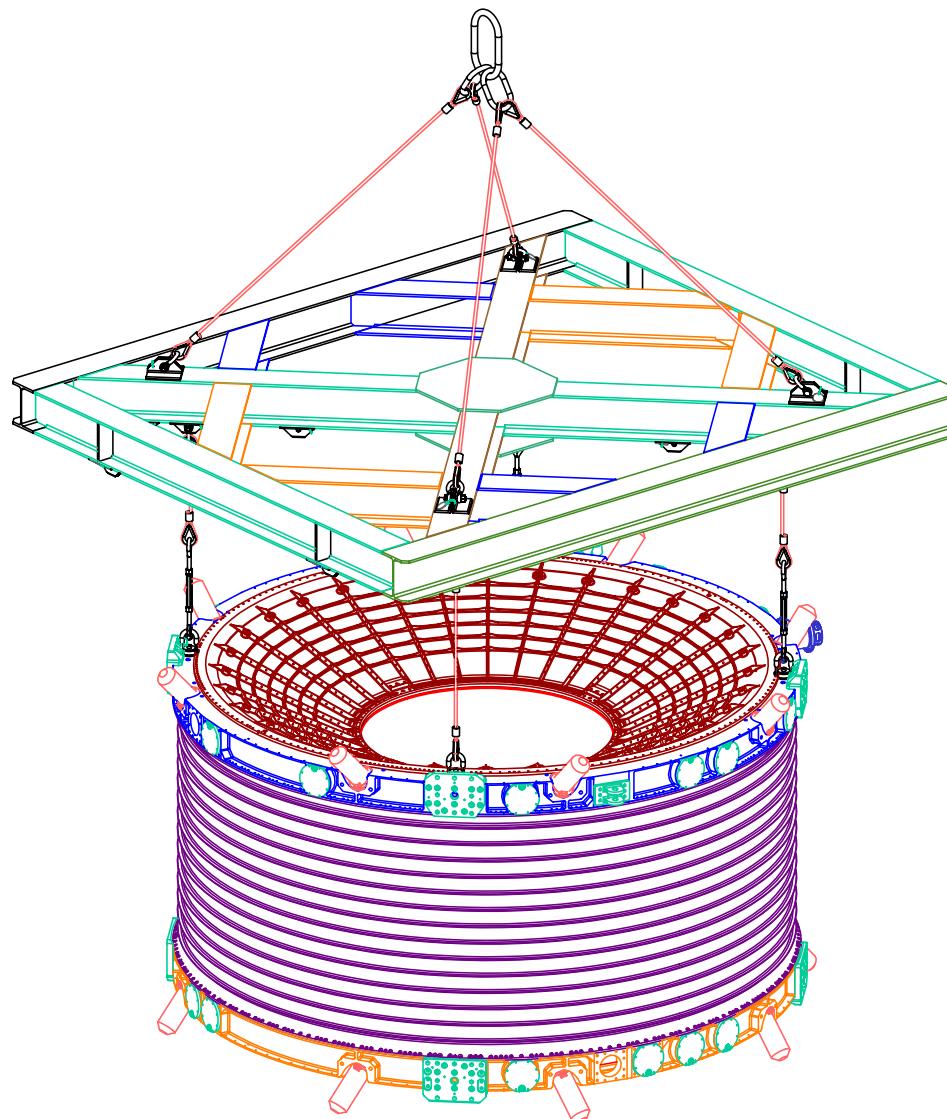


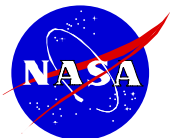
VC Removal and Installation at JSC and CERN



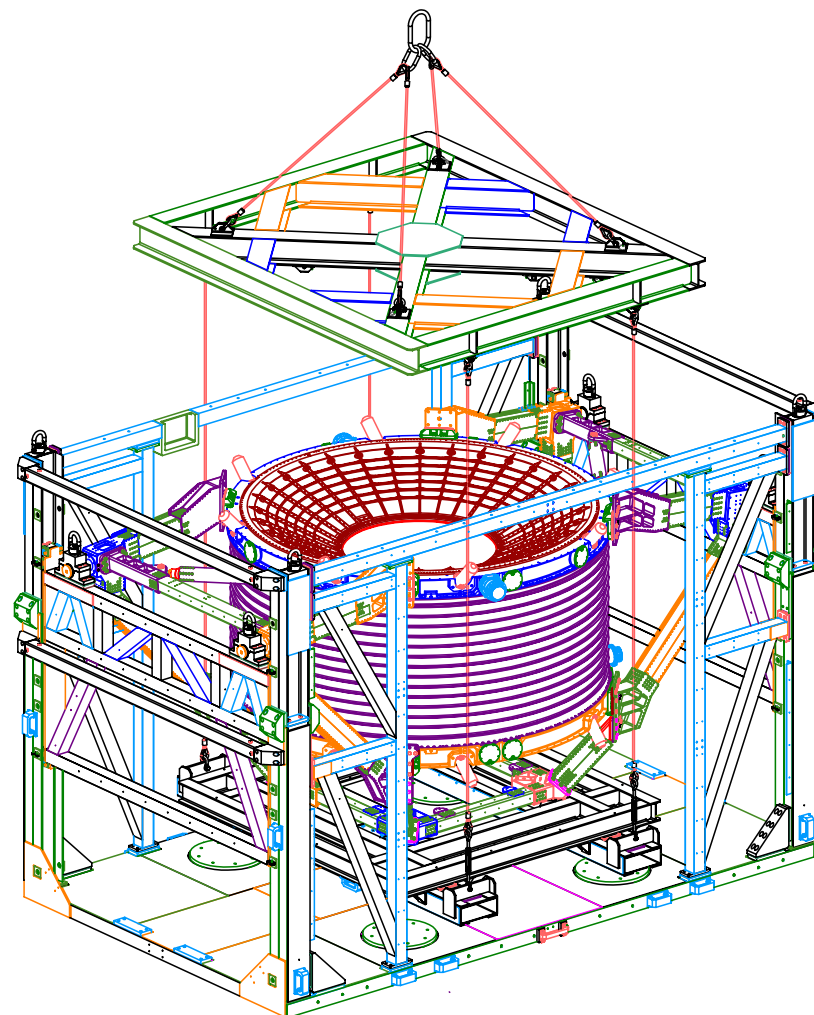


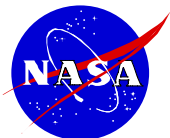
VC lift at JSC, SCL, and CERN



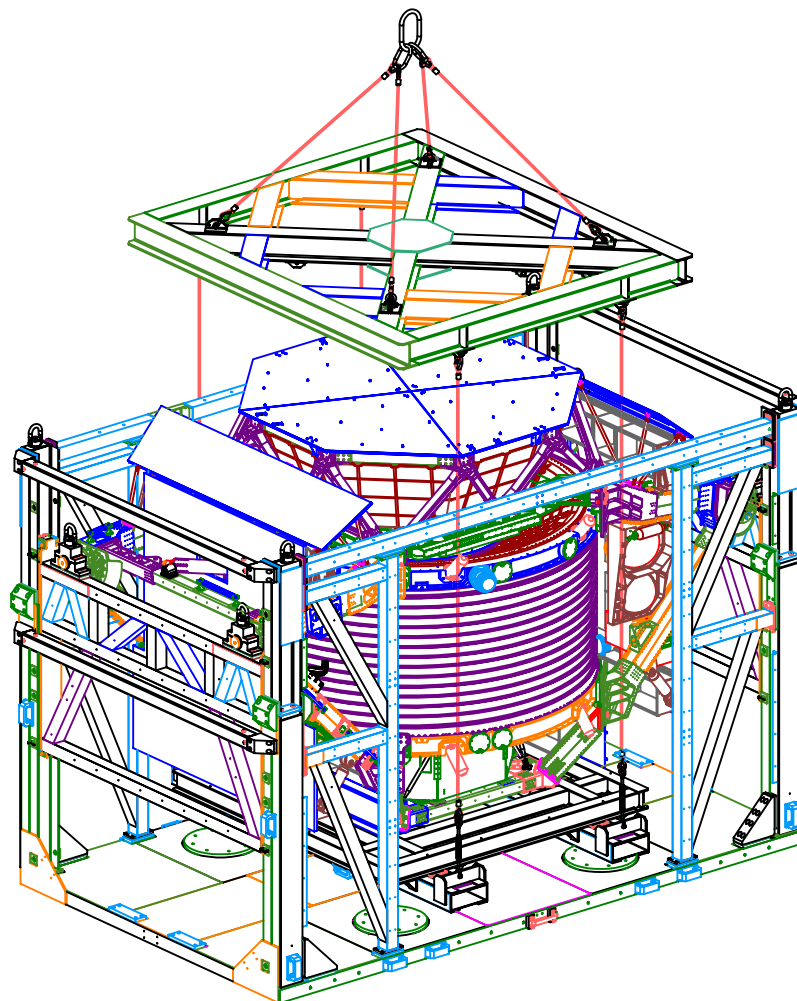


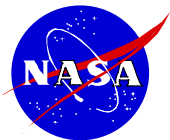
Lower USS-02 installation and removal at JSC



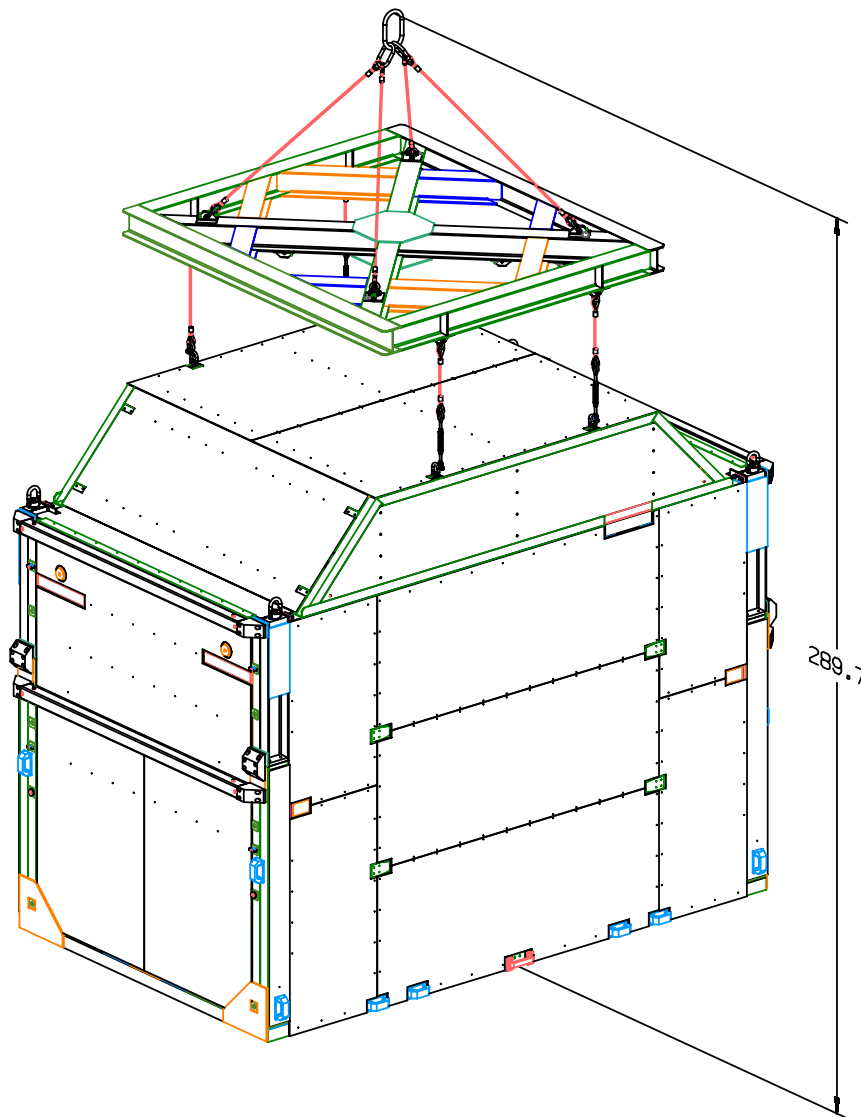


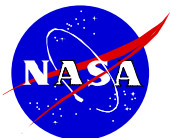
Lower AMS-02 Payload installation and removal at CERN, ESTEC, and KSC



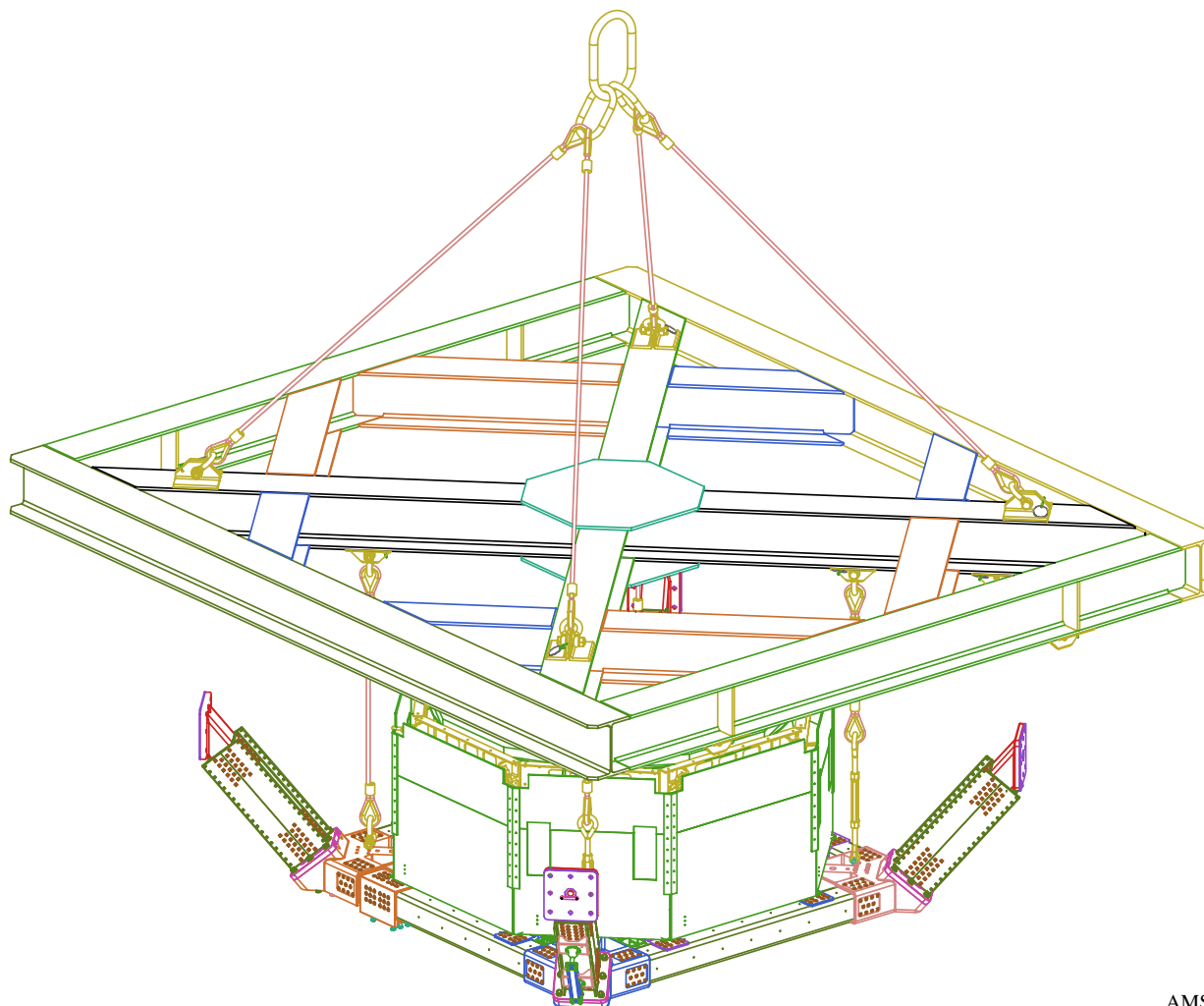


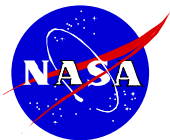
Shipping Cover installation at JSC, CERN, and KSC



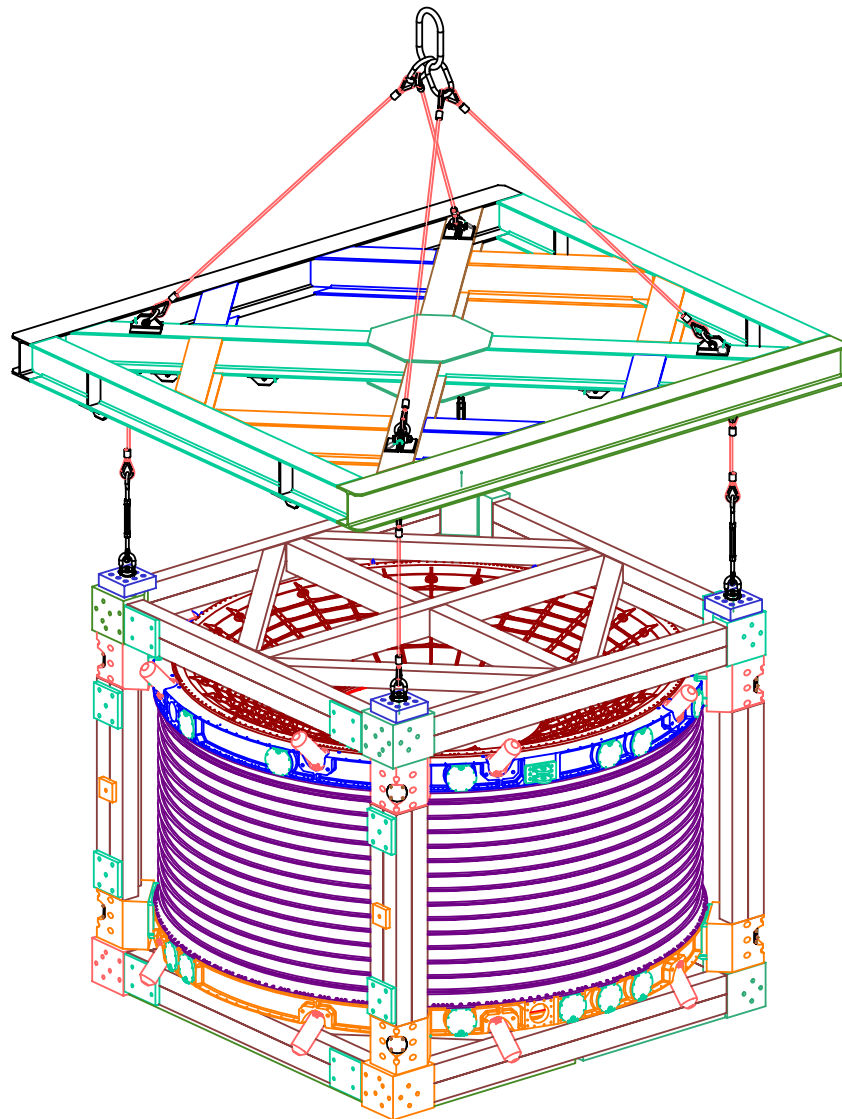


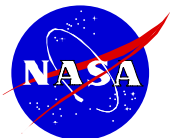
Lower USS/AMS Payload lift at JSC (without AMS-02 Experiment components), CERN, and LAPP - Annecy



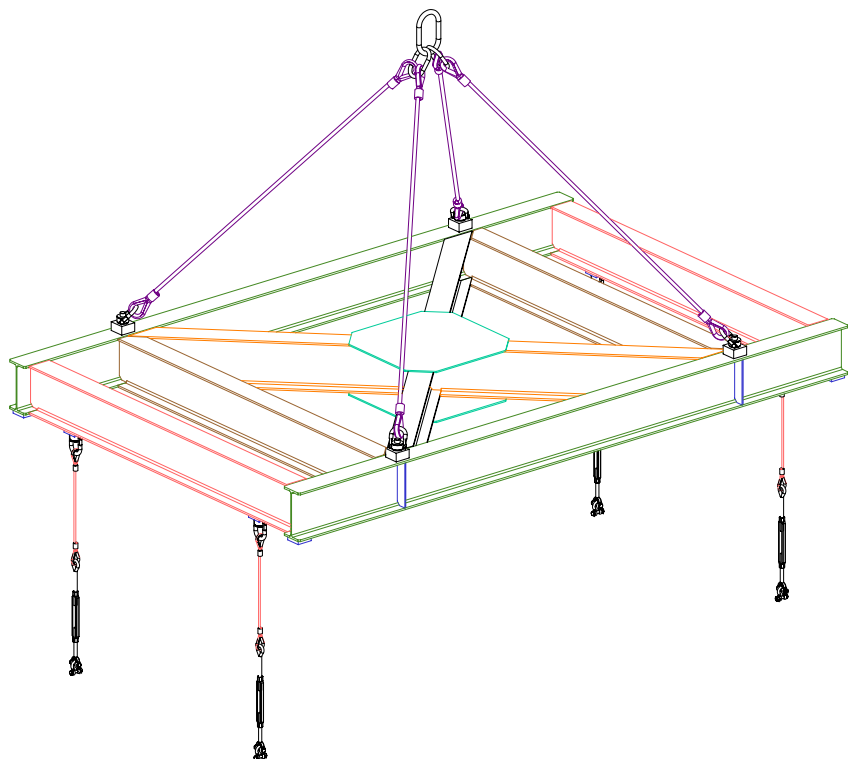


VCTF lift at JSC and INFN





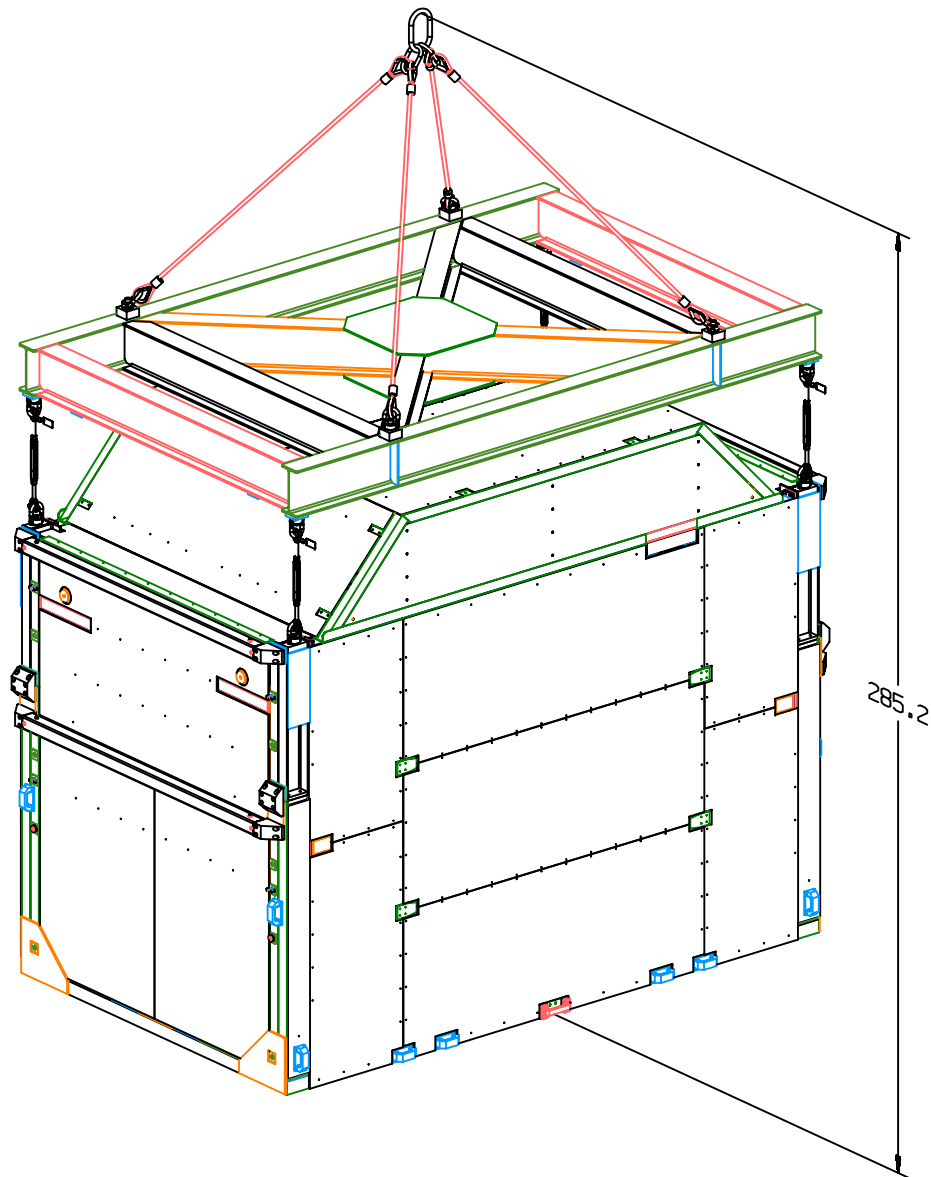
Primary Lifting Fixture (PLF)

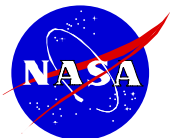


- Made from welded A-36 structural steel shapes
- Proof loaded in all lifting configurations:
 - PSS with the full AMS-02 Payload (all configurations)
 - AMS-02 Payload at the 4 sill trunnions
 - AMS Payload in the PSS to the different configurations

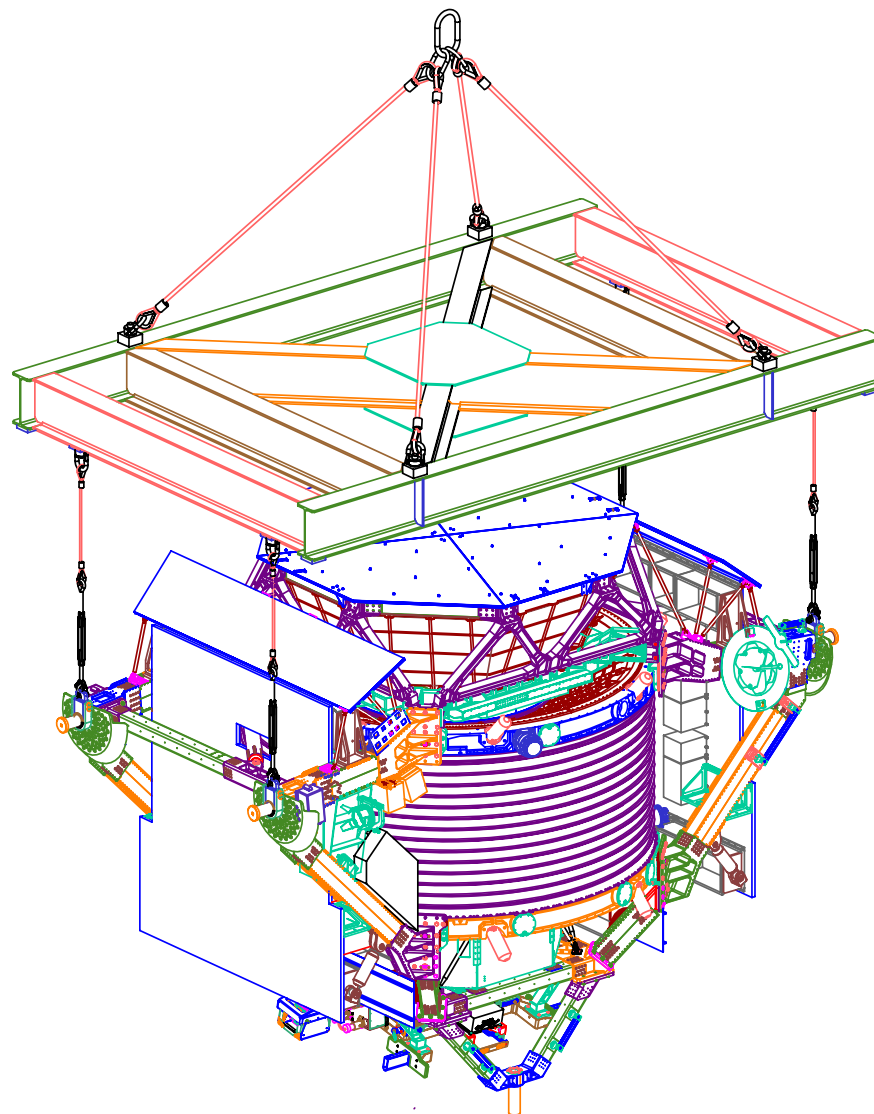


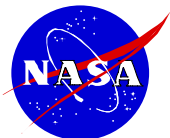
High level shipping configuration at JSC, CERN, and KSC



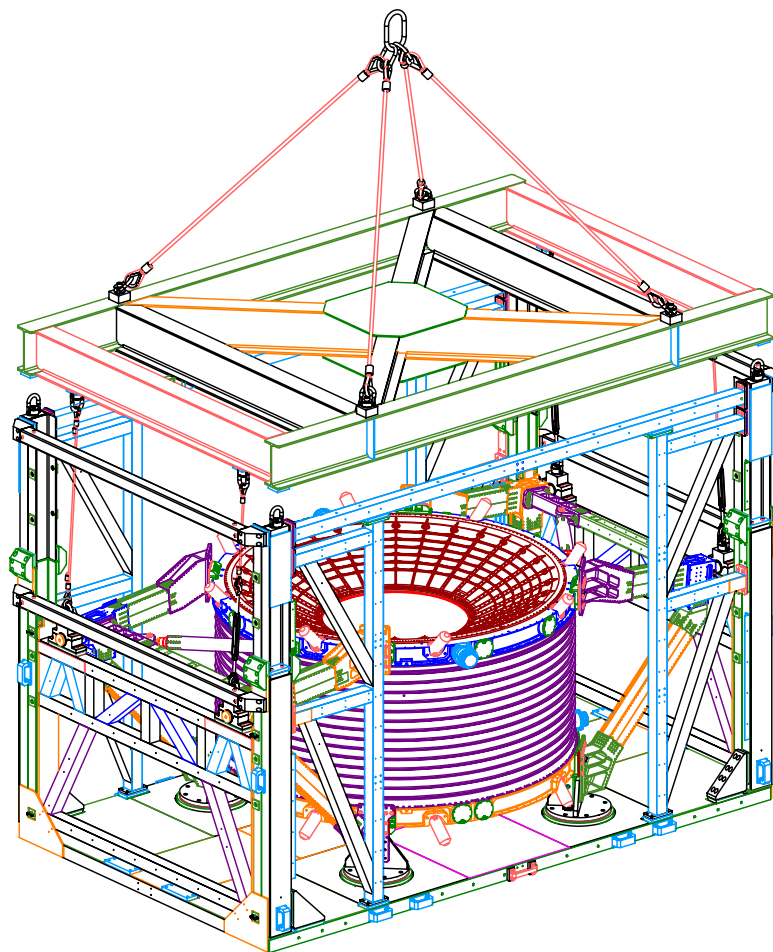


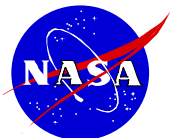
Lifting the AMS-02 Payload Assembly at KSC





Reconfiguring the USS in the PSS at JSC and CERN





Reconfiguring the AMS-02 Payload in the PSS at CERN, ESTEC, and KSC

